

November 8, 2023

Planning and Engineering
300 West Arch Avenue
Searcy, AR 72143

RE: Searcy Regional Economic Development Corporation

To Whom It May Concern,

The following is a preliminary evaluation for stormwater management concerning the future development of the property. The property, at the present time, is primarily utilized for recreational purposes focusing on ballfields. Due to the current nature of the development consisting of largely permeable area and the proposed future development being aimed towards industrialization, a need arises to determine the handling of stormwater increase. The calculations that will follow in this report are based on the current development and an assumed future development consisting largely of impervious surfaces. To determine and propose the required detention, arials from Google, USGS topo maps and conservative assumptions based on a 50-year storm event will be used.

The site is 93.67 acres $\pm$ and will be divided into three (3) lots. Of these, one lot will be dedicated as a 300-foot drainage easement along Iorio Creek essentially dividing the property into two developments. Accordingly, the management of stormwater will require each lot to have detention and the calculations will reflect this. Also, there currently exists along Queensway Street, to the extreme east of the property, a roadside swale that will see an increase in stormwater due to development and will need to be evaluated for capacity as development increases.

Lot 1

The proposed size of this lot is 44.46 acres $\pm$ and has a gentle slope southeasterly towards Iorio Creek. The following is a summary of calculations based on the assumption that time of concentration is equal:

Pre-Development

C – 0.44
T_C – 45 min
I – 3.57 in/hr
Q – 69.46 cfs

Post-Development

C – 0.84
T_C – 45 min
I – 3.57 in/hr
Q – 132.72 cfs

The increase in stormwater is **63.27 cfs** holding the rainfall intensities equal for pre- and post-development conditions. The required detention storage for this condition is approximately 175,000 cubic feet. At a depth of four (4) feet, this results in approximately 1.00 acre of surface area.

Reducing the time of concentration for post-development to increase the rainfall intensity, the results are as follows:

Pre-Development

C – 0.44
T_C – 45 min
I – 3.57 in/hr
Q – 69.46 cfs

Post-Development

C – 0.84
T_C – 15 min
I – 6.04 in/hr
Q – 224.60 cfs

The increase in stormwater is now **155.15 cfs** allowing for a shorter time of concentration and increased rainfall intensity from pre- and post-development conditions. The required detention storage for this condition is approximately 238,000 cubic feet. At a depth of four (4) feet, this results in approximately 1.40 acres of surface area.

It is recommended that 1.5 acres ± be utilized for shared detention.

Lot 3

The proposed size of this lot is 39.96 acres ± and has a bit steeper slope, as seen on a USGS topo, and flows northeasterly towards Iorio Creek. Given that the tracts are close in size with relatively similar topography, the same assumptions will be utilized here as in Lot 1. The following is a summary of calculations based on the assumption that time of concentration is equal:

Pre-Development

C – 0.44
T_C – 45 min
I – 3.57 in/hr
Q – 62.70 cfs

Post-Development

C – 0.83
T_C – 45 min
I – 3.57 in/hr
Q – 118.50 cfs

The increase in stormwater is **55.80 cfs** holding the rainfall intensities equal for pre- and post-development conditions. The required detention storage for this condition is approximately 155,000 cubic feet. At a depth of four (4) feet, this results in approximately 0.90 acres of surface area.

Reducing the time of concentration for post-development to increase the rainfall intensity, the results are as follows:

Pre-Development

C – 0.44
T_C – 45 min
I – 3.57 in/hr
Q – 62.70 cfs

Post-Development

C – 0.83
T_C – 15 min
I – 6.04 in/hr
Q – 200.54 cfs

The increase in stormwater is now **137.84 cfs** allowing for a shorter time of concentration and increased rainfall intensity from pre- and post-development conditions. The required detention storage for this condition is approximately 211,000 cubic feet. At a depth of four (4) feet, this results in approximately 1.20 acres of surface area.

It is recommended that 1.3 acres ± be utilized for shared detention.

The above calculations are based on a development with 80% impervious surface area and is reflected in the runoff coefficient approaching near impervious conditions. A shared detention would allow for a better utilization of the property as each separate development would not be required to detain water. Underground storm sewer should be the primary means of conveyance so the existing ditches will not be inundated with the increase in runoff.

Thank you,
Davidson Engineering, PLLC



Jeffrey H. Nichols, Jr., E.I.

Attached Calculations

Lot 1 Calculations

	Manual		2-yr Intensity	5-yr Intensity	10-yr Intensity	25-yr Intensity	50-yr Intensity	100-yr Intensity
	Area	$\Sigma (C \cdot A)$ <i>Total Area</i>	Pre- 2.06	Pre- 2.45	Pre- 2.78	Pre- 3.23	Pre- 3.57	Pre- 3.90
			Post- 2.06	Post- 2.45	Post- 2.78	Post- 3.23	Post- 3.57	Post- 3.90
	---	Composite C	$Q_{2 \text{ year}} \text{ (cfs)}$	$Q_{5 \text{ year}} \text{ (cfs)}$	$Q_{10 \text{ year}} \text{ (cfs)}$	$Q_{25 \text{ year}} \text{ (cfs)}$	$Q_{50 \text{ year}} \text{ (cfs)}$	$Q_{100 \text{ year}} \text{ (cfs)}$
Pre-Development	44.46	0.44	40.00	47.76	54.14	62.88	69.46	75.96
Post-Development	44.46	0.84	76.43	91.26	103.46	120.15	132.72	145.14
			Increase 36.43	Increase 43.50	Increase 49.32	Increase 57.27	Increase 63.27	Increase 69.18

*Calculations based on equal rainfall intensities

	Manual		2-yr Intensity	5-yr Intensity	10-yr Intensity	25-yr Intensity	50-yr Intensity	100-yr Intensity
	Area	$\Sigma (C \cdot A)$ <i>Total Area</i>	Pre- 2.06	Pre- 2.45	Pre- 2.78	Pre- 3.23	Pre- 3.57	Pre- 3.90
			Post- 3.47	Post- 4.16	Post- 4.72	Post- 5.47	Post- 6.04	Post- 6.60
	---	Composite C	$Q_{2 \text{ year}} \text{ (cfs)}$	$Q_{5 \text{ year}} \text{ (cfs)}$	$Q_{10 \text{ year}} \text{ (cfs)}$	$Q_{25 \text{ year}} \text{ (cfs)}$	$Q_{50 \text{ year}} \text{ (cfs)}$	$Q_{100 \text{ year}} \text{ (cfs)}$
Pre-Development	44.46	0.44	40.00	47.76	54.14	62.88	69.46	75.96
Post-Development	44.46	0.84	129.04	154.69	175.52	203.41	224.60	245.43
			Increase 89.04	Increase 106.94	Increase 121.38	Increase 140.53	Increase 155.15	Increase 169.47

*Calculations based on different rainfall intensities

Lot 3 Calculations

	Manual	$\Sigma (C \cdot A)$ <i>Total Area</i>	2-yr Intensity	5-yr Intensity	10-yr Intensity	25-yr Intensity	50-yr Intensity	100-yr Intensity
	Area		Pre- 2.06	Pre- 2.45	Pre- 2.78	Pre- 3.23	Pre- 3.57	Pre- 3.90
			Post- 2.06	Post- 2.45	Post- 2.78	Post- 3.23	Post- 3.57	Post- 3.90
	---	Composite C	$Q_{2 \text{ year}} \text{ (cfs)}$	$Q_{5 \text{ year}} \text{ (cfs)}$	$Q_{10 \text{ year}} \text{ (cfs)}$	$Q_{25 \text{ year}} \text{ (cfs)}$	$Q_{50 \text{ year}} \text{ (cfs)}$	$Q_{100 \text{ year}} \text{ (cfs)}$
Pre-Development	39.96	0.44	36.11	43.11	48.88	56.76	62.70	68.57
Post-Development	39.96	0.83	68.24	81.48	92.37	107.28	118.50	129.59
			Increase 32.13	Increase 38.37	Increase 43.50	Increase 50.51	Increase 55.80	Increase 61.02

*Calculations based on equal rainfall intensities

	Manual	$\Sigma (C \cdot A)$ <i>Total Area</i>	2-yr Intensity	5-yr Intensity	10-yr Intensity	25-yr Intensity	50-yr Intensity	100-yr Intensity
	Area		Pre- 2.06	Pre- 2.45	Pre- 2.78	Pre- 3.23	Pre- 3.57	Pre- 3.90
			Post- 3.47	Post- 4.16	Post- 4.72	Post- 5.47	Post- 6.04	Post- 6.60
	---	Composite C	$Q_{2 \text{ year}} \text{ (cfs)}$	$Q_{5 \text{ year}} \text{ (cfs)}$	$Q_{10 \text{ year}} \text{ (cfs)}$	$Q_{25 \text{ year}} \text{ (cfs)}$	$Q_{50 \text{ year}} \text{ (cfs)}$	$Q_{100 \text{ year}} \text{ (cfs)}$
Pre-Development	39.96	0.44	36.11	43.11	48.88	56.76	62.70	68.57
Post-Development	39.96	0.83	115.21	138.12	156.71	181.62	200.54	219.13
			Increase 79.10	Increase 95.01	Increase 107.83	Increase 124.85	Increase 137.84	Increase 150.56

*Calculations based on different rainfall intensities